Volume Coverage Pattern Explorer –instruction manual

Version 1

April 2004
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Table of Contents

1) Introduction

The VCPExplorer version 1.3.2 is a tool to aid in visualizing radar beam paths with respect to the surrounding terrain and the uncertainties in echo height measurements. Every WSR-88D and TDWR is available for viewing in the United States and its territories. High resolution terrain maps are associated with each radar.

2) Objective of the VCPExplorer

The VCPExplorer v1.3.2 is designed as a training and operational tool to assist forecasters in understanding the effects of new Volume Coverage Patterns (VCPs) on vertical height sampling and beam blockage associated with the release of the ORPG version OB4. This tool allows for the comparison of new and old VCPs for the WSR-88Ds. In addition, the differences in coverage patterns of WSR-88Ds and TDWRs can be explored with the VCPExplorer.

3) Minimum System Requirements

The VCPExplorer is written in Java using Vis-AD, a language that provides for maximum cross-platform compatability. However, as a result, it is resource intensive. We recommend that for minimum functionality, your computer should have at least 256 MB of RAM, a 32 MB video card with OpenGL libraries installed and an 800 Mhz processor. For acceptable performance, you should have at least 512 MB of RAM, a 64 MB video card with OpenGL libraries installed and a 1 Ghz processor. The VCPExplorer can be installed on Linux or Windows platforms.

4) Installation Instructions

The installation CD contains both the Linux and Windows installers.

For Windows machines: Please uninstall any prior versions of VCPRPE or VCPExplorer before installing this version. From the CD-ROM, double-click **install.exe**. You do not need to install any other software. A Java virtual machine is included with this software. Follow the instructions in the installer.

For Linux machines: Please uninstall any prior versions of VCPRPE or VCPExplorer before installing this version. Open a shell and, go to the directory where the installer is located on the CD-ROM. At the prompt type: **sh ./install.bin**. A Java virtual machine is included with this download. It will be run automatically when you run the shell script.

These instructions and the programs for download are also located at http://www.cimms.ou.edu/~kmanross/VCPRPE/Installer/install.htm.

5) Screen Layout

The VCPExplorer consists of 4 main parts: the Info Bar, the PPI Panel, the RHI Panel and the VCP Controls (Fig. 1).
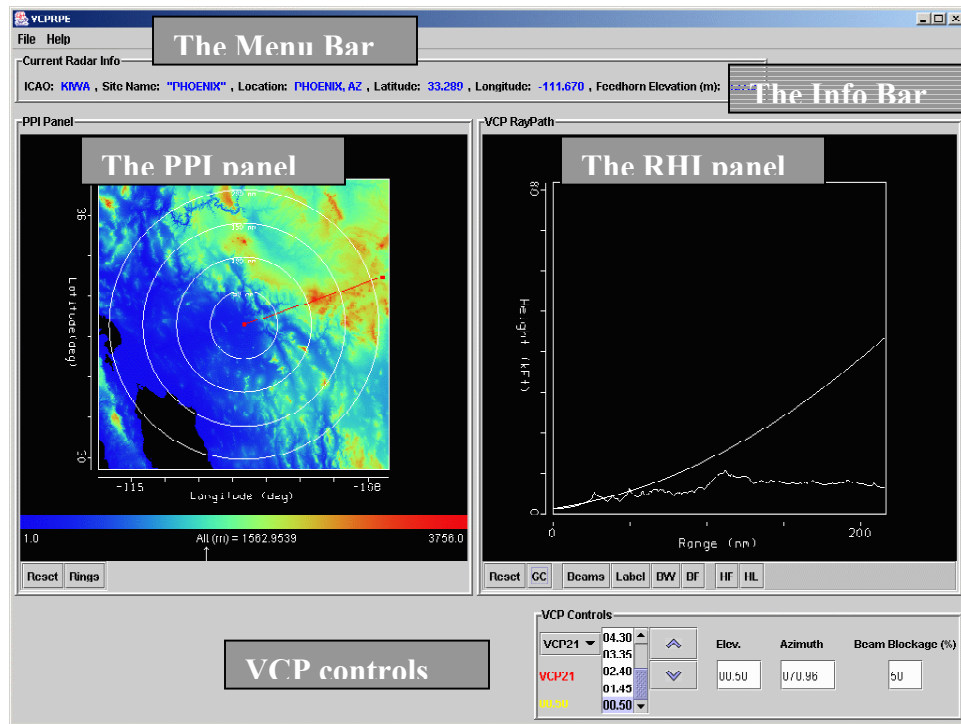
Figure 1: The general layout of VCPExplorer v1.3.2. The labels in grey boxes are explained in the text.

a) The Menu Bar
   Click on the **File menu** to view the menu including radar selection and exiting the VCPExplorer. The **radar** selection contains a menu of WSR-88Ds and TDWRs. The WSR-88D (TDWR) radars are listed by their four (three) letter identifiers.

b) The Info Bar
   All the information for the selected radar is contained here. Listed is the ICAO identifier, site name, physical location, latitude, longitude, and antenna feedhorn elevation in meters (MSL).

c) The PPI Panel
   A planview topography map in meters (MSL) includes an overlay of white range rings (in 50 nm increments) and a red azimuth line. The azimuth line can be oriented in any direction from the radar by placing the mouse cursor over the small red box at the tip of the azimuth line, then left clicking and dragging the mouse around the radar. Alternatively, you may enter in an azimuth orientation in the VCP controls area.
   The color bar below the planview map contains a label indicating the altitude of wherever the small white vertical arrow happens to be pointing (Fig 2). You may move the arrow by placing your cursor over it and then holding the mouse button down while dragging it left or right.
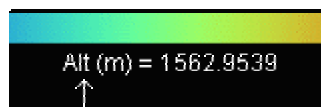   i   The Reset Button

Figure 2 Altitude label corresponding to the horizontal position of the white arrow along the color bar.

This button resets the zoom level of the planview map. The zoom and pan features will be explained under "**Mouse Controls**".

ii   The Rings Button
This toggles on and off the range rings.

d) The RHI panel
This panel displays a vertical cross section of several displays lying along the red azimuth line in the PPI panel. These displays include one or more radar beams, the underlying topography, and displays of echo height uncertainty.   The vertical scaling is in kft (MSL). There are several control buttons at the bottom of the panel that will be described below.

i   The Reset Button
This button resets the display to a default zoom and pan.

ii   The GC button
The Ground Clutter (GC) button turns on all azimuths and ranges where beam blockage exists. The display appears on the PPI panel as translucent gray shading for all areas where the radar beam is blocked for every azimuth (Fig. 3).
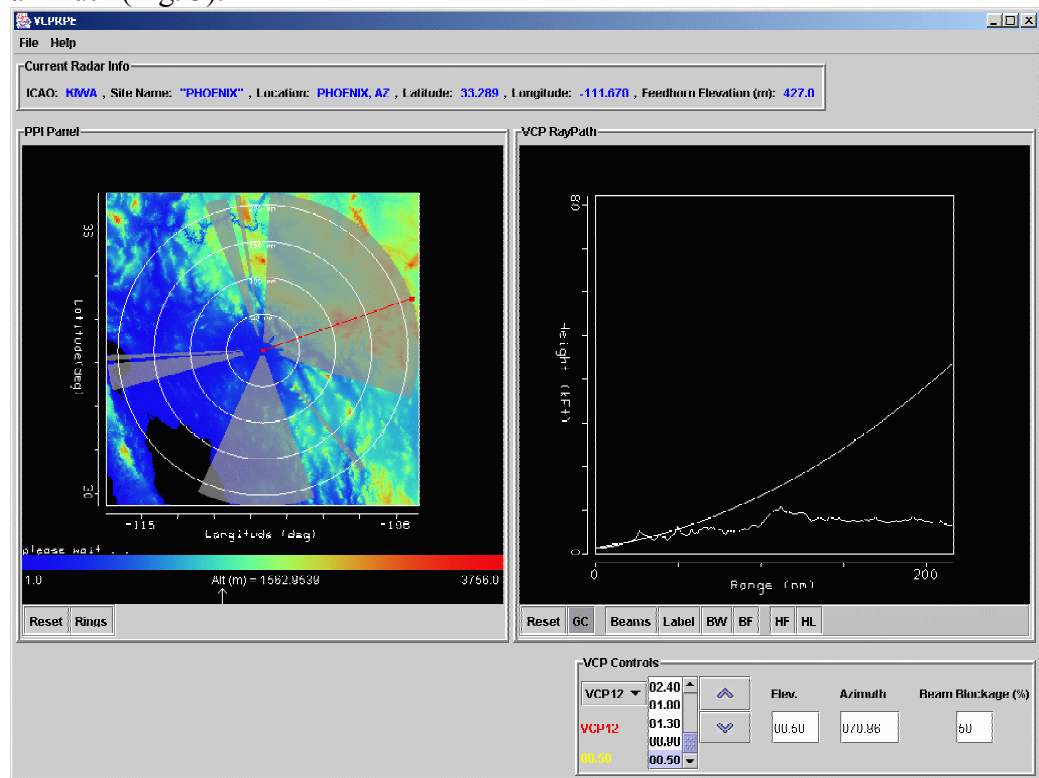

Figure 3. The VCPExplorer display showing the beam blockage as translucent grey areas following the activation of the GC button in the RHI panel. The beam blockage exists along the 0.50 degree elevation slice and where the beam is intersected by 50% or more of the terrain.

The blockage is calculated by viewing the radar beam as a spreading cone emanating from the radar. The program calculates the percentage of the terrain that intersects the conical beam at specific distances from the radar. The nearest distance from the radar at which the percentage of blockage exceeds a threshold, the beam is considered blocked and all points at and beyond are colored translucent grey on the PPI panel. This process is CPU intensive and requires some time to compute. You will see a "please wait" message in the panels as the program finishes its job.

You can change the beam elevation and threshold beam blockage percentage in the **VCP controls** panel.

iii   The Beams button
This button turns on all the beams for whatever VCP you chose in the **VCP controls** panel. Note that the beams are indicating beam center points. Figure 4 shows an example of the Beams button turned on.
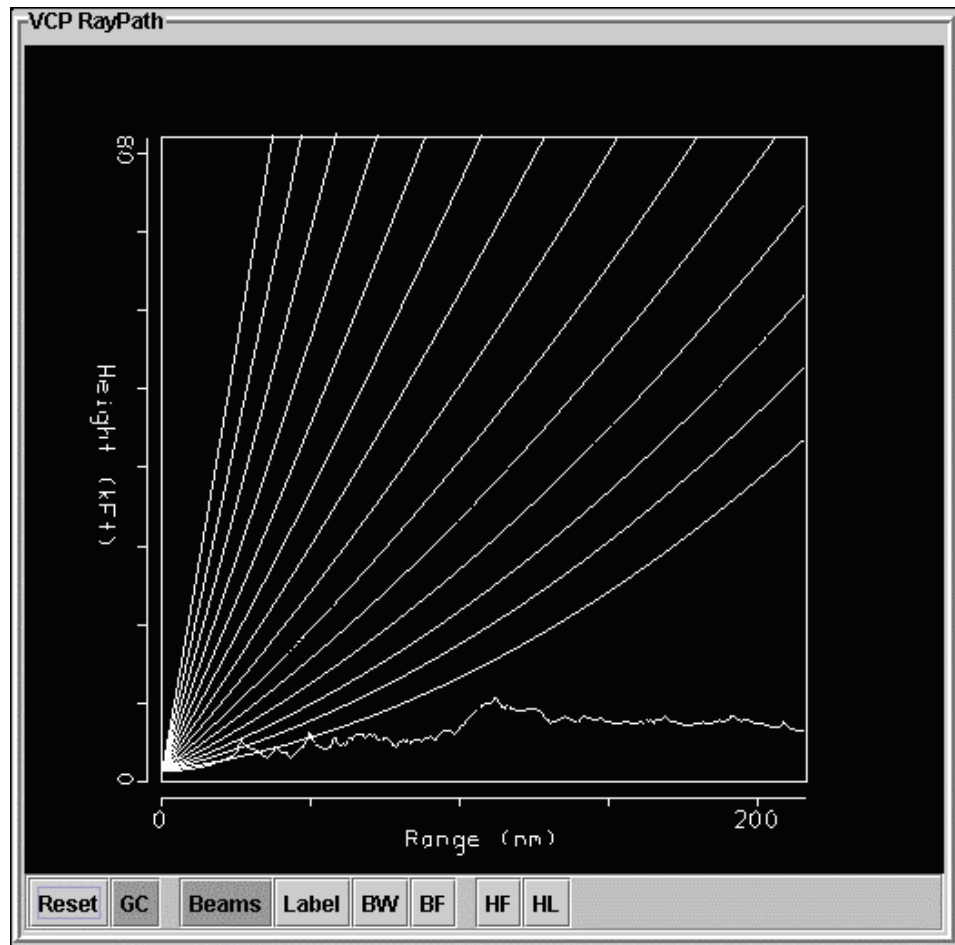

Figure 4 The RHI panel with the Beams button active.

iv   The Label button
This button labels each beam with the elevation angle in the RHI panel.

v   The BW button
The Beam Width button displays the beam width edges are displayed as yellow dashed lines in addition to the beam centerline (Fig. 5). The beam width edges are defined as the limit where the output power falls to one half of the peak. If all the slices of a VCP are selected for display with the Beams button, then the dashed lines alternate from yellow to purple with adjacent beams. Be careful not to confuse one beam edge with another in areas where significant beam overlap exists in some VCPs.
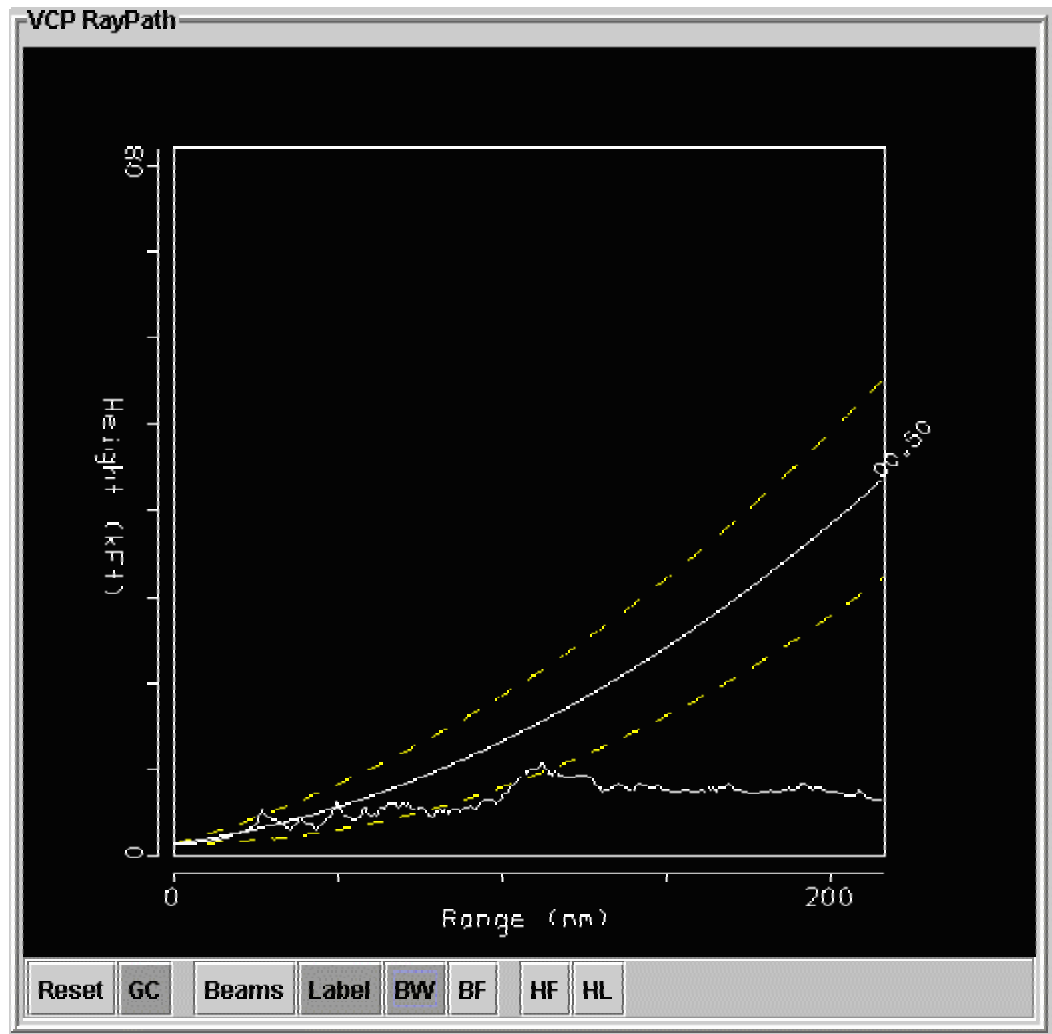

Figure 5 The RHI panel with the BW button invoked.

vi   The BF button
The Beam Fill button fills the beam path between the beam bottom and top with green. If all the slices of a VCP are selected with the Beams button, then the color filling alternates between purple and yellow. With certain VCPs, there is considerable overlap between adjacent slices making the color filling to appear confusing. This tells you that beam overlap exists. See Figure 6 for an example.
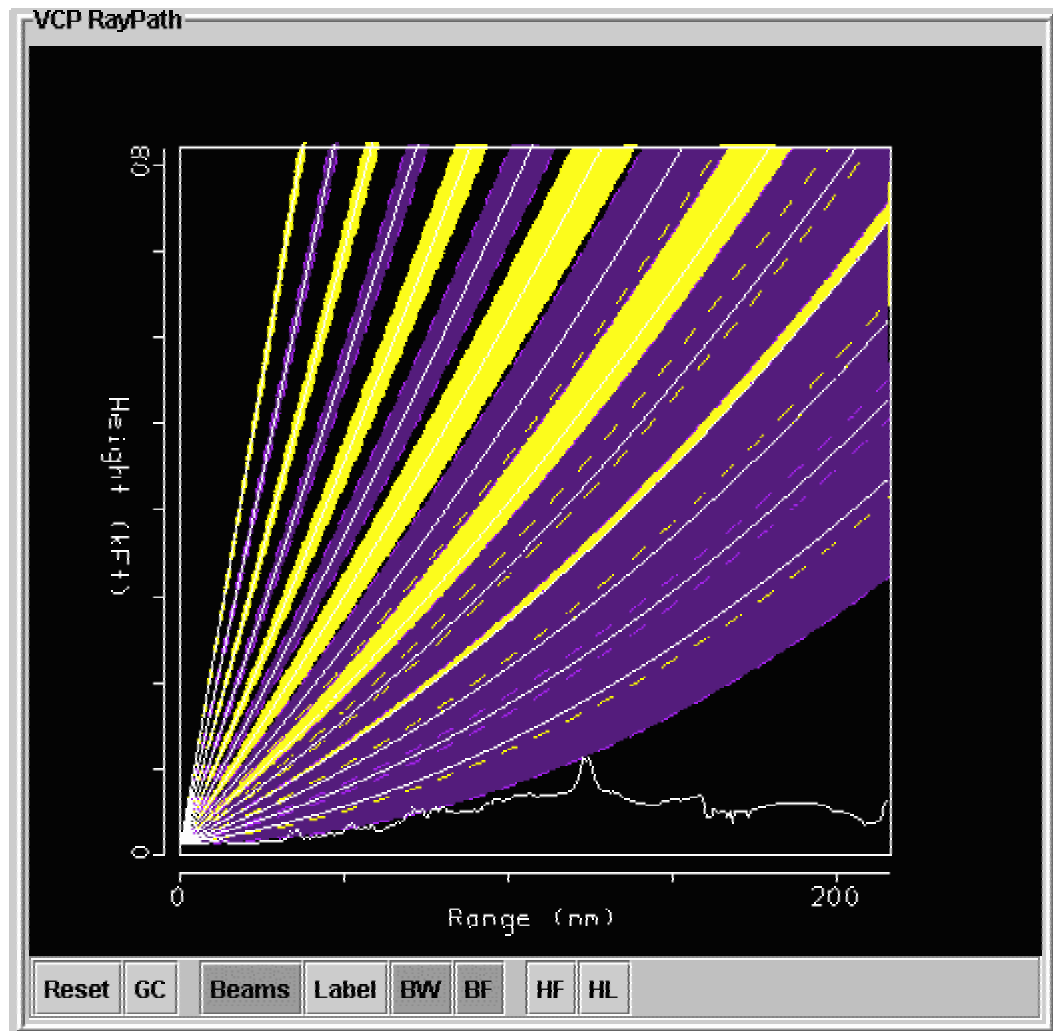
Figure 6 The RHI panel with the BF, and Beams buttons showing alternate yellow, purple beam filling.

vii   The HF button
        The Height underestimate Fill button displays the height a storm would be underestimated by the radar for any point in the RHI panel (Fig. 7). The concept, originally introduced by Brown and Wood (1999) assumes that the storm top needs to reach the beam centerpoint before an algorithm such as echo top recognizes the echo top. Note that invoking this button displays the height error in rainbow colors for all elevation slices and that a color bar appears at the bottom of the display.
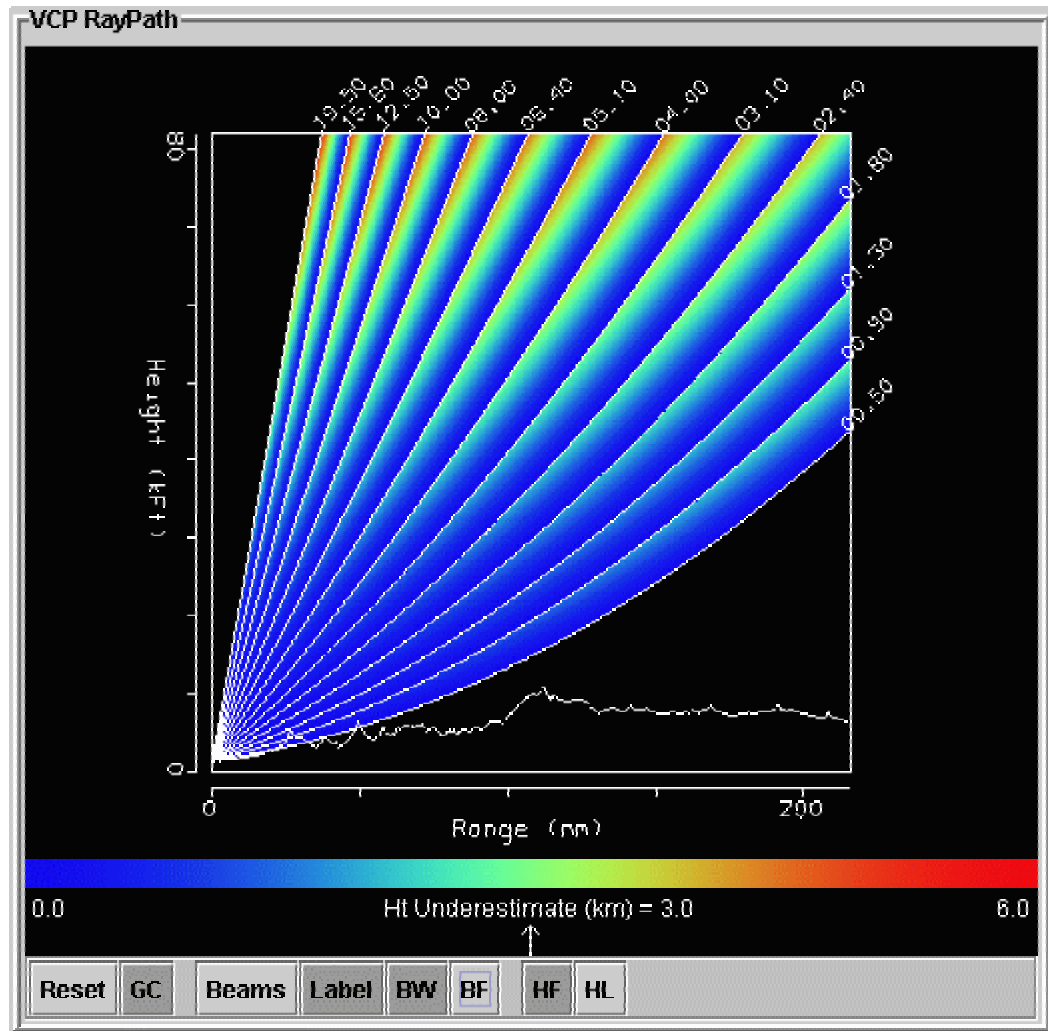
Figure 7 The RHI panel with the HF button invoked.

viii   The HL button
The Height underestimate Line button is another way to visualize height underestimations by the WSR-88D (Fig. 8). Invoking the button introduces a horizontal green line and a sawtoothed yellow line. The green line represents an idealized steady state echo top (e.g., storm top, echo top, max height of 55dBZ) as it progresses to or away from the radar. It can be adjusted up or down by clicking and dragging the little box at the right end of the line with your left mouse button. The yellow jagged line represents the height of the storm as it appears by radar assuming that the echo top needs to reach the beam centerpoint in order for it to be registered with the same qualities as that defined for the green line.
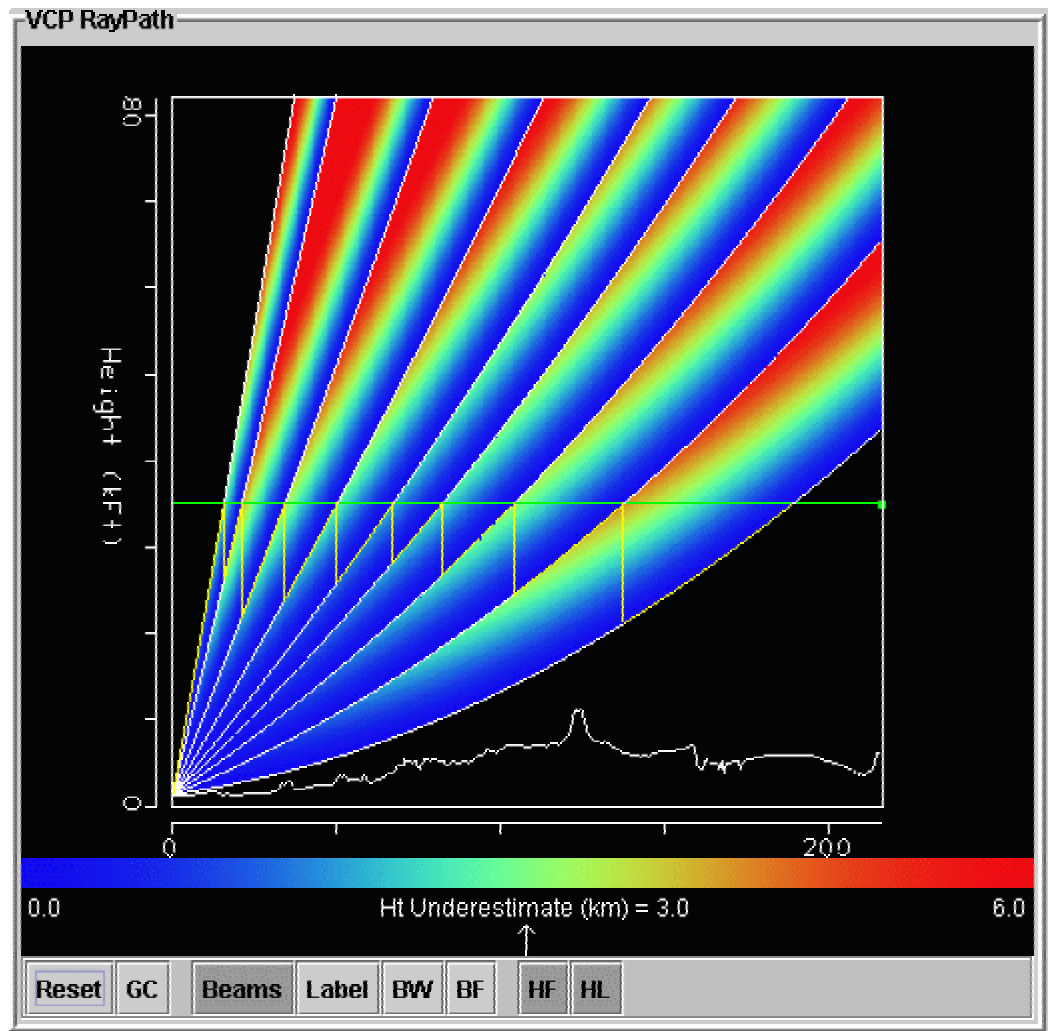
Figure 8 The RHI panel with the HL button invoked. The constant altitude (green) line has been dragged down from its default altitude of 70 kft MSL

e) VCP controls

The lower right side of the VCP Explorer (Fig. 9) contains controls that allow you to choose a pre-set VCP, manually introduce an elevation and azimuth angle, and change the thresholding percentage at which beam blockage is highlighted in the PPI panel. Here are more specific comments about each control.
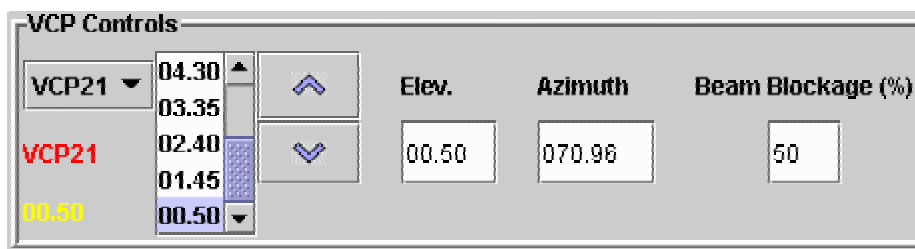

Figure 9 The VCP controls section of the VCP Explorer

i   VCP chooser

Other VCPs can be easily added to the VCP chooser. See the section on Configuration files below.

ii   Manual elevation angle entry

You may manually change the elevation angle to something not contained in a selected VCP for any case except when the Height Underestimate Filling (HF) button is turned on in the RHI panel. For the case when the Beams button is on, manually entering a nonstandard elevation angle will move the beam centerpoint but not the beam half power perimeters. We suggest that you turn off the Beams, and HF buttons if you want to view nonstandard elevations.

iii   Manual azimuth entry

Use the Azimuth entry when you want to apply a specific azimuth on the PPI panel.

iv   Manual percentage entry for beam blockage

The Beam Blockage entry allows you to put in any threshold percentage of blockage to determine whether a beam is blocked and shading is applied to the PPI panel. The method by which beam blockage is determined is by calculating the amount of terrain intersecting the 3-dimensional beam from the vantage point of the radar. Therefore, beam blockage may occur even though it appears very little terrain is blocking the beam in the RHI panel.

6) Mouse Controls

   a) Left mouse button
     i   **Click and drag** the ends of the azimuth line (PPI panel) and the constant height line (RHI panel HL button) to move the line.
     ii   **Shift+click and drag** a box inside either the RHI panel or the PPI panel to create a box into which the panel will zoom.

   b) Middle mouse button
     i   **Click and drag** anywhere inside either the PPI or RHI panels gives a cursor readout in distance from the radar and height above sea level.

   c) Right mouse button
     i   **Click and drag** this button to reposition the location of either panel.
     ii   **Shift+click and drag** to zoom up or down. Drag upward to zoom in and drag downward to zoom out.

7) Configuration files

Several files help define the WSR-88D sites, the TDWR sites and the available VCPs. These files can be found in the ConfigFiles directory. **Please** make a backup of the original file should you desire to make changes to any file.

   a) 88D_siteList.dat

This is a TAB-DELIMITED file showing all the WSR-88D site information.

b) TDWR_siteList.dat
   This is similar to a) but for the TDWR sites.
c) vcpList.dat
   This file contains two TAB-DELIMITED columns: The VCP identifier (e.g., VCP11) and a COMMA-DELIMITED list of elevation angles. This is the file that the VCP Explorer uses to label the respective parameters in the VCP Controls area. You are likely to modify this file more than any other should you wish to add new VCPs into the VCP Explorer. Again, make a backup of this file before making any changes.
d) VCPExplorer_Help.html
   Contains the help file for VCP Explorer.

8) Contact info

For installation issues, contact:

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For all other issues, contact:

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